CITY OF CHULA VISTA

DEPARTMENT OF PLANNING & BUILDING

BUILDING DIVISION

276 Fourth Avenue Chula Vista CA 91910

619-691-5272 619-585-5681 FAX

MINIMUM CONSTRUCTION SPECIFICATIONS

FORM 4592

These are minimum specifications established by the California Building Code (CBC). They do not, however, supersede any more restrictive specifications shown on the approved plans. Code sections listed below refer to the 2001 edition of the CBC, as adopted by the City of Chula Vista.

I. MATERIAL SPECIFICATIONS

A. **Mortar** to be used for construction of masonry walls, foundation walls and retaining walls must have a compressive strength of 1,800 psi minimum. One possible mix contains the following proportions by volume:

1 part Portland cement
$3^1/_2$ parts sand
$^1/_4$ part hydrated lime or lime putty

Note that the use of plastic cement is not permitted (CBC Section 2103.2).

B. **Grout** must have a compressive strength equal to 2,000 psi minimum. One possible mix contains the following proportions by volume:

1 part Portland cement
3 parts sand
$^1/_{10}$ part hydrated lime or lime putty
1 to 2 parts pea gravel ($^3/_8$-inch aggregate)

Add water until pouring consistency is achieved without segregation of the grout constituents. The use of plastic cement is not permitted (Section 2103.2).

C. **Masonry units** must be Type "N" and must comply with ASTM Standard Specification C90-86 for hollow load-bearing concrete masonry units (Section 2102.2 (5)).

D. **Reinforcing steel** used in concrete structures must be deformed and must comply with CBC Section 1903.5.1. Reinforcing steel used in masonry structures must comply with Section 2102.2 (10).

E. **Structural steel** must comply with Standard No. 22-1. Steel used as structural shapes such as wide flange sections, channels, plates and angles may comply with ASTM Standard Specification A36-81a. Pipe columns may comply with ASTM Standard Specification A53-82. See Section 2202.1.

II. FOUNDATIONS AND UNDER-FLOOR SPACE

A. Concrete for footings must have a minimum compressive strength of 2,500 psi at 28 days or be composed of:

1 part Portland cement
$2^1/_2$ parts sand
$3^1/_2$ parts of $^3/_4$-inch maximum-diameter gravel
7 gallons of water maximum per sack of cement

See CBC Table 18-1-C reproduced below for minimum foundation requirements for stud bearing walls.

B. Concrete slabs-on-grade must be at least $3^1/_2$ inches thick. See Section 1900.4.4.

C. When wood joists or the bottom of wood structural floors without joists are located closer than 18 inches or wood girders are located closer than 12 inches to exposed ground in crawl spaces or unexcavated areas located within the periphery of the building foundation, the floor assembly, including post, girders, joists and subfloor, shall be approved wood with resistance to decay.

When the above under-floor clearances are required, the under-floor area shall be accessible. Accessible under-floor areas shall be provided with a minimum 18-inch by 24-inch opening unobstructed by pipes, ducts and similar construction. All under-floor access openings shall be effectively screened or covered. Pipes, ducts and other construction shall not interfere with the accessibility to or within under-floor areas.

Table No. 18-1-C/Foundations for Stud Bearing Walls, Minimum Requirements[1, 2, 3, 4]

Number of Floors Supported by Foundation[4]	Minimum Thickness of Foundation Wall (inches)		Minimum Width of Footing (inches)	Minimum Thickness of Footing (inches)	Minimum Depth Below Undisturbed Ground Surface (inches)
	Concrete	Unit Masonry			
1	6	6	12	6	12
2	8	8	15	7	18
3	10	10	18	8	24

[1] Where unusual conditions or frost conditions are found, footings and foundations shall be as required in Section 1806.1.
[2] The ground under the floor may be excavated to the elevation of the top of the footing.
[3] Interior stud bearing walls may be supported by isolated footings. The footing width and length shall be twice the width shown in this table and the footings shall be spaced not more than 6 feet on center.
[4] Foundations may support a roof in addition to the stipulated number of floors. Foundations supporting roofs only shall be as required for supporting one floor.

All foundation plates or sills and sleepers on a concrete or masonry slab, which is in direct contact with earth, and sills which rest on concrete or masonry foundations, shall be treated wood or Foundation redwood, all marked or branded by an approved agency.

D. Foundations supporting wood shall extend at least 6 inches above the adjacent finish grade as indicated in Section 1806.1.

E. All sills must have full bearing on the footing or slab and must be bolted to the foundation with not less than $^5/_8$-inch nominal diameter steel bolts embedded at least 7 inches into the concrete or masonry. Bolts must be spaced not to exceed 6 feet on center. There must be a minimum of 2 bolts per piece with bolts not over 12 inches from cut end of sills. See Section 1806.6. Bolts must have a properly sized nut and 2x2x3/16" thick washer.

F. Under-floor areas must be ventilated by approved mechanical means or by openings into the under-floor area walls. Wall openings must have a net area of not less than 1 square foot for each 150 square feet of under-floor area. Openings must be arranged to provide cross ventilation and must be covered with corrosion-resistant wire mesh with openings of $^1/_4$ inch per Section 2306.7.

III. WOOD FRAMING

A. All joists, rafters, beams and posts 2 to 4 inches thick must be No. 2 grade Douglas fir-larch or better. All posts and beams 5 inches and thicker must be No. 1 grade Douglas fir-larch or better. See Item B in this section for lumber grading requirements for studs.

B. In one- or two-story buildings, studs for exterior walls and interior bearing walls must be not less than 2x4s at 16 inches on center. See Table No. 23-IV-B reproduced below for exceptions. Studs for interior nonbearing partitions may be 2x3s at 16 inches on center. All studs must be utility grade or better; note that utility grade studs must be spaced not more than 16 inches on center, must support not more than a roof and ceiling and must not exceed 8 feet in height for exterior or load-bearing walls or 10 feet in height for interior nonload-bearing walls. See Section 2320.11.1

1. Cutting and notching of wood studs is addressed in Section 2320.11.9. See Figure 1 on page 3 of this information bulletin.
   a. Any bearing wall stud may be cut or notched to a depth not exceeding 25 percent of its width. See Table 1 on page 4 of this information bulletin.
   b. Nonbearing studs may be cut or notched to a depth not exceeding 40 percent of the stud width. See Table 2 on page 4.
2. Boring of wood studs is addressed in Section 2320.11.10. See Figure 2 on page 3 and Figure 3 on page 4 of this information bulletin.
   a. Any bearing wall stud may contain a hole not greater in diameter than 40 percent of the stud width. Bored holes not greater than 60 percent of the width of the stud are permitted in any wall where each bored stud is doubled, provided not more than two such successive doubled studs are so bored. Bored holes shall not be located at the same section of the stud as a cut or a notch. See Table 3 on page 4.
   b. Nonbearing wall studs in nonbearing partitions may contain bored holes not greater than 60 percent of the width of the stud. See Table 4 on page 4.

C. Fire blocks must be provided for walls at ceilings, floor levels and concealed spaces at 10 feet on center horizontally and vertically. See Section 708.2.1(1).

D. Every exterior wood stud wall and main cross-stud partition must be braced at each end and as needed to resist wind and seismic forces. See Section 2320.11.3.

E. Provide lateral support for beams, rafters, and joists to

Table No. 23-IV-B Size, Height and Spacing of Wood Studs

Stud Size (Inches)	Bearing Walls				Nonbearing Walls	
	Lateral Unsupported Stud Height[1] (Feet)	Supporting Roof and Ceiling Only	Supporting One Floor, Roof and Ceiling	Supporting Two Floors, Roof and Ceiling	Lateral Unsupported Stud Height[1] (Feet)	Spacing (Inches)
		Spacing (inches)				
2x3[2]	—	—	—	—	10	16
2x4	10	24	16	—	14	24
3x4	10	24	24	16	14	24
2x5	10	24	24	—	16	24
2x6	10	24	24	16	20	24

[1] Listed heights are distances between points of lateral support placed perpendicular to the plane of the wall. Increases in unsupported height are permitted where justified by an analysis.

[2] Shall not be used in exterior walls.

prevent rotation or lateral displacement in accordance with the following (Section 2320.12.8, 2320.8.3 and Div III Chapter 23 Section 4.4.1.1.):

F. A Certificate of Inspection for glued-laminated wood members issued by an approved agency must be given to the building inspector prior to installation. See Section 2304.1.

G. Floor joists under and parallel to bearing partitions must be doubled. See Section 2320.8.5.

H. Boring and notching of joists is addressed in Section 2320.8.5. See Figure 4 on page 6 of this information bulletin.

Notches on the ends of joists shall not exceed one fourth the joist depth. Holes bored in joists shall not be within 2 inches of the top or bottom of the joist, and the diameter of any such hole shall not exceed one third the depth of the joist. Notches in the top or bottom of the joists shall not exceed one sixth the depth and shall not be located in the middle third of the span.

I. Purlins to support roof loads may be supported by braces which are not less than 45 degrees from the horizontal. See Section 2320.12.7.

J. Rafter ties must be spaced not more than 4 feet on center where rafters and ceiling joists are not parallel. See Section 2320.12.6.

K. Provide $^1/_2$-inch minimum clearance between top plate of interior nonbearing partitions and bottom chord of trusses.

L. Provide double top plates with minimum 48-inch lap splice. See Section 2320.11.2.

M. For roof slopes of less than 3:12, members supporting

Figure 1/Cutting and notching of studs

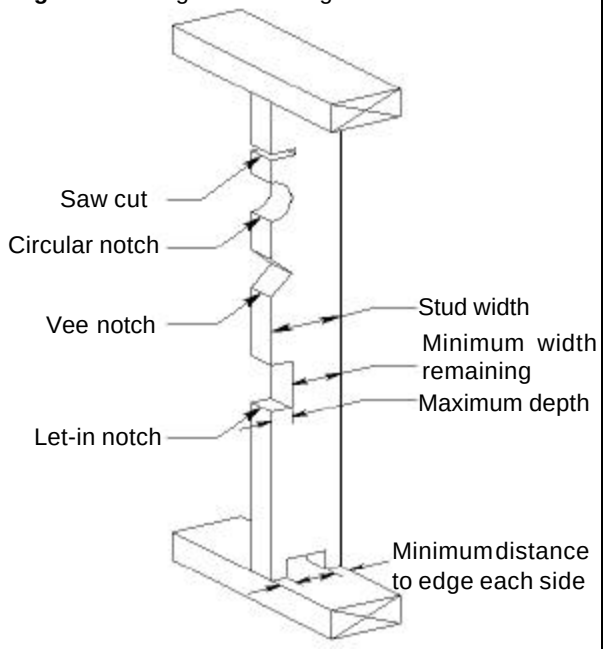
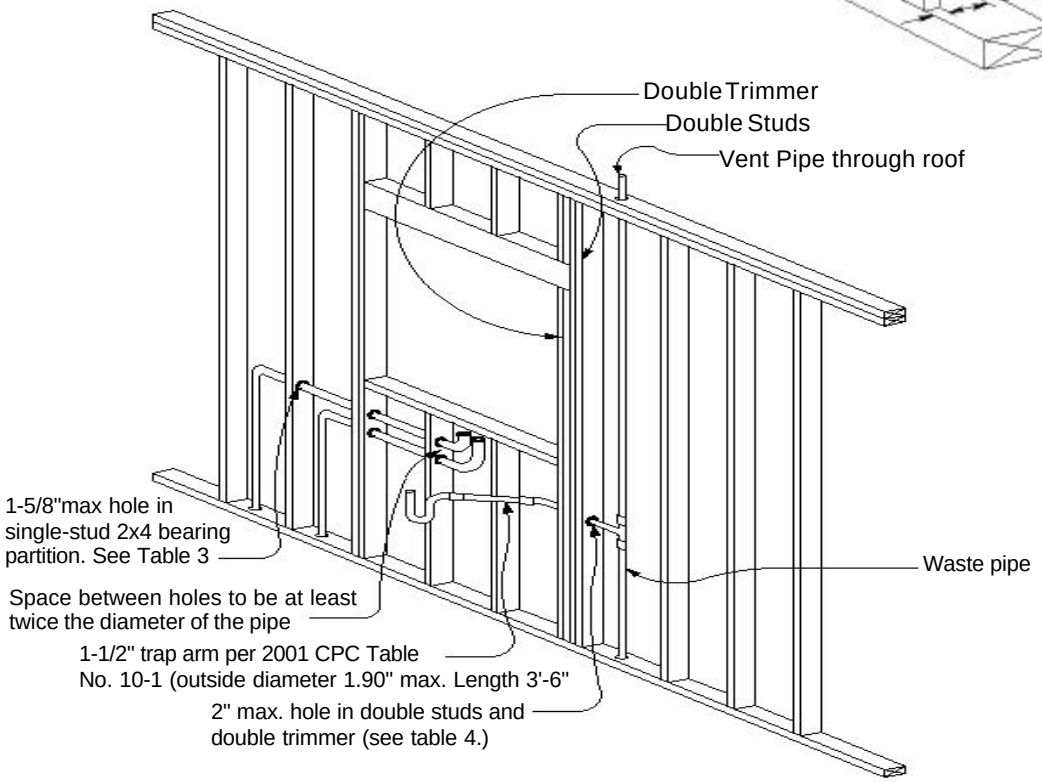


Figure 2/Sample Bearing Partition



rafters and ceiling joists such as ridge boards, hips and valleys must be designed as bearing members. See Section 2320.12.1.

N. Nailing will be in compliance with CBC Table No. 23-II-B-1 reproduced on page 5 of this information bulletin.

IV. WEATHER PROTECTION

A. All wood siding must be placed over an approved, weather-resistive barrier. See Section 1402.1.

B. Every opening in any exterior wall must be flashed with sheet metal or waterproof building paper. See Section 1402.

C. Basement foundation walls below finished grade must be dampproofed on the outside. See Section 1402.4.

D. A weep screed must be provided for all stucco exterior stud walls at or below the foundation plate line. See Section 2506.A.5.2.

V. MISCELLANEOUS

A. Attic areas 30 inches or higher must be accessible by an opening not less than 22 inches by 30 inches. With a furnace in the attic, the opening must not be less than 30 inches by 30 inches (22 inches by 30 inches if the largest piece of equipment can be accommodated). See Section 1505.1 and

Table 1/Bearing Wall Studs (Cutting and Notching)

Stud Size	Maximum depth of edge cut or notch (inches)	Minimum wood width remaining after cut or notch (inches)
2 x 3	5/8	1 7/8
2 x 4	7/8	2 5/8
2 x 6	1 3/8	4 1/8

Table 2/Nonbearing Wall Studs (Cutting and Notching)

Stud Size	Maximum depth of edge cut or notch (inches)	Minimum wood width remaining after cut or notch (inches)
2 x 3	1	1 1/2
2 x 4	1 3/8	2 1/8
2 x 6	2 1/8	3 3/8

Table 3/Bearing Wall Studs (Boring)

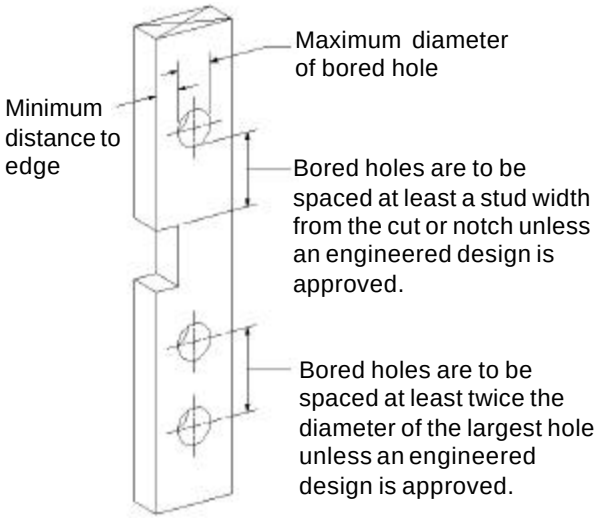
Stud Size	Maximum diameter of bored hole (inches)	Minimum distance to edge after boring (inches)
2 x 3	1	1 1/4 each side of hole
2 x 4	1 3/8	1 1/16 each side of hole
2 x 6	2 1/8	1 11/16 each side of hole

Table 4/Nonbearing Wall Studs (Boring)

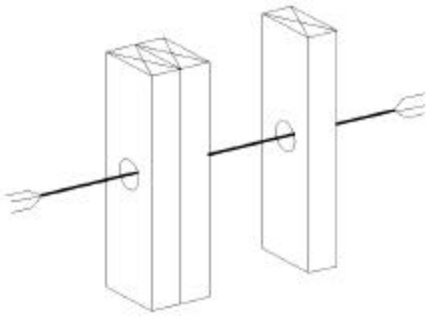
Stud Size	Maximum diameter of bored hole (inches)	Minimum distance to edge after boring (inches)
2 x 3	1 1/2	1/2 each side of hole
2 x 4	2	3/4 each side of hole
2 x 6	3 1/4	1 1/8 each side of hole

Figure 3/Boring of Studs

Case 1/General Requirements

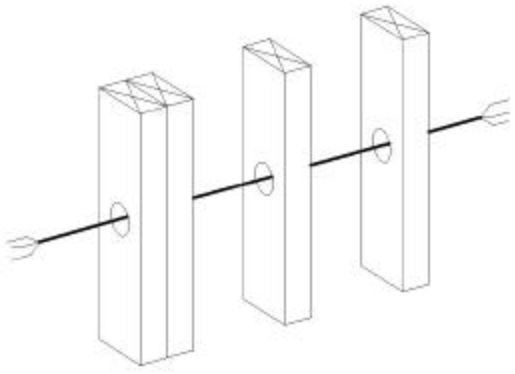


Case 2/Boring of Bearing Partitions With Doubled Studs



Only two successive doubled studs may be bored; Table 3 data applies.

Case 3/Boring of Nonbearing Partitions



Any number of single studs or doubled studs in nonbearing partitions may be bored; Table 4 data applies.

TABLE 23-II-B-1-NAILING SCHEDULE

Connection	Nailing[1]
Joist to sill or girder, toenail	3-8d
Bridging to joist, toenail each end	2-8d
1" x 6" subfloor or less to each joist, face nail	2-8d
Wider than 1" x 6" subfloor to each joist, face nail	3-8d
2" subfloor to joist or girder, blind and face nail	2-16d
Sole plate to joist or blocking, face nail	16d at 16" o.c.
Sole plate to joist or blocking, at braced wall panels	3-16d per 16"
Top plate to stud, end nail	2-16d
Stud to sole plate	4-8d, toenail or 2-16d, end nail
Double studs, face nail	16d at 24" o.c.
Doubled top plates, typical face nail	16d at 16" o.c.
Doubled top plates, lap slice	8-16d
Blocking between joists or rafters to top plate, toenail	3-8d
Rim Joist to top plate, toenail	8d at 6" o.c.
Top plates, laps and intersections, face nail	2-16d
Continuous header, two pieces	16d at 16" o.c. along each edge
Ceiling joists to plate, toenail	3-8d
Continuous header to stud, toenail	4-8d
Ceiling joists, laps over partitions, face nail	3-16d
Ceiling joists to parallel rafters, face nail	3-16d
Rafter to plate, toenail	3-8d
1" brace to each stud and plate, face nail	2-8d
1" x 8" sheathing or less to each bearing, face nail	2-8d
Wider than 1" x 8" sheathing to each bearing, face nail	3-8d
Built-up corner studs	16d at 24" o.c.
Built-up girder and beams	20d at 32" o.c. at top and bottom and staggered 2-20d at ends and at each splice
2" planks	2-16d at each bearing
Wood Structural Panels and particleboard:[2]	
Subfloor, roof and wall sheathing (to framing):	
$^1/_2$" and less	6d[3]
$^{19}/_{32}$" to $^3/_4$"	8d[4] or 6d[5]
$^7/_8$" to 1"	8d[3]
$1^1/_8$" to $1^1/_4$"	10d[4] or 8d[5]
Combination subfloor-underlayment (to framing):	
$^3/_4$" and less	6d[5]
$^7/_8$" to 1"	8d[5]
$1^1/_8$" to $1^1/_4$"	10d[4] or 8d[5]
Panel Siding (to framing):	
$^1/_2$" or less	6d[6]
$^5/_8$"	8d[6]
Fiberboard Sheathing:[7]	
$^1/_2$"	No. 11 ga.[8], 6d[4], No. 16 ga.[9]
$^{25}/_{32}$"	No. 11 ga.[8], 8d[4], No. 16 ga.[9]
Interior paneling:	
$^1/_4$"	4d[10]
$^3/_8$"	6d[11]

1 Common or box nails may be used except where otherwise stated.

2 Nails spaced at 6 inches on center at edges, 12 inches at intermediate supports, except 6 inches at all supports where spans are 48 inches or more. For nailing of wood structural panels and particleboard diaphragms and shear walls, refer to Section 2315.3 and 2315.4. Nails for wall sheathing may be common, box or casing.

3 Common or deformed shank.

4 Common.

5 Deformed shank.

6 Corrosion-resistant siding or casing nails conforming to the requirements of Section 2304.3.

7 Fasteners spaced 3 inches on center at exterior edges and 6 inches on center at intermediate supports.

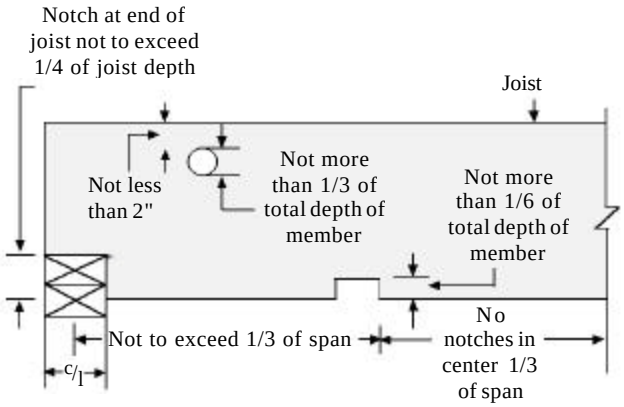
8 Corrosion-resistant roofing nails with $^7/_{16}$-inch-diameter head and $1^1/_2$-inch length for $^1/_2$-inch sheathing and $1^3/_4$-inch length for $^{25}/_{32}$-inch sheathing conforming to the requirements of Section 2304.3.

9 Corrosion-resistant staples with nominal $^7/_{16}$-inch crown and $1^1/_8$-inch length for $^1/_2$-inch sheathing and $1^1/_2$-inch length for $^{25}/_{32}$-inch sheathing conforming to the requirements of Section 2304.3.

10 Panel supports at 16 inches [20 inches if strength axis in the long direction of the panel, unless otherwise marked]. Casing or finish nails spaced 6 inches on panel edges, 12 inches at intermediate supports.

11 Panel supports at 24 inches . Casing or finish nails spaced 6 inches on panel edges, 12 inches at intermediate supports.

Figure 4/Notching and Boring of Joists



California Mechanical Code Section 908.

B. Shower walls must be finished to a height of 70 inches above the drain inlet with a smooth, hard, nonabsorbent surface. See Section 807.1.3.

C. Contact San Diego Gas & Electric Company, Customer Extension Planning Department, for meter location. All wiring must comply with the 2001 California Electrical Code.

D. In new construction, smoke detectors must receive their primary power from the building wiring when such wiring is served from a commercial source and must be equipped with a battery backup. Smoke detectors may be solely battery-operated when installed in existing buildings, buildings without commercial power, or buildings which undergo alterations, repairs or additions. See Section 310.9.1.

VI. ROOF COVERING MATERIALS AND APPLICATION

A. The following definitions are applicable:

Built-up roof covering is two or more layers of felt cemented together and surfaced with cap sheet, mineral aggregate, smooth coating or similar surfacing material.

Class A roof covering is any Class A roofing assembly, asbestos-cement shingles or sheets, exposed concrete slab roof, sheet ferrous or copper roof covering, slate shingles or concrete or clay roof tiles.

Class B roof covering is any Class B roofing assembly.

Class C roof covering is any Class C roofing assembly.

Wood shakes are tapered or nontapered pieces of approved durable wood of random widths ranging from 4 inches to 14 inches. Wood shakes come in four types and various dimensions: hand split and resawn or semisplit in 15-, 18- or 24-inch lengths; taper split in 24-inch lengths; straight split in 18- or 24-inch lengths and tapersawn in 24-inch lengths or longer.

Wood shingles are tapered pieces of approved durable wood, sawed both sides, of random widths ranging from 3 inches to 14 inches and in lengths of 16 inches, 18 inches or 24 inches.

B. Roof covering materials must be applied in an approved manner in accordance with manufacturer's instructions and Chapter 15 of the 2001 California Building Code. Table Nos. 15-B-1, 15-B-2, 15-D-1, 12-D-2 and 15-E have been partially reproduced following this section.

a. Metal roofing exposed to the weather must be corrosion-resistant. Corrugated steel, ribbed steel and flat steel sheets must be a minimum of No. 30 galvanized sheet gauge. Other ferrous sections or shapes must be a minimum of No. 26 galvanized sheet gauge.

b. Wood shingles and shakes must comply with Standard Nos. 15-4 and 15-3, respectively, and must be installed per Table No. 15-B-2. All wood shingles and shakes must have a minimum Class C roof covering rating.

C. Flashing must be provided.

a. Roof valley flashing must be of not less than No. 28 galvanized sheet gauge corrosion-resistant metal extending 8 inches from the center line each way for asphalt, metal and wood shingles and 11 inches from the center line each way for asphalt-cement shingles, slate shingles, clay and concrete tile and wood shakes. Sections of flashing shall have an end lap of not less than 4 inches. In general, the metal valley flashing must have a 32-inch-wide underlayment directly below it of one layer of Type 15 felt running the full length of the valley in addition to the required underlayment.

b. Where the roof and vertical surfaces join, flashing and counterflashing must be provided per the roofing manufacturer's instructions.

D. Roof insulation must serve as a rigid base for application of a roof covering and must meet the requirements of Section 1504 and Table No. 15-A for fire-retardancy. Insulation for built-up roofs must be applied per Table No. 15-E. For other roofing materials, insulation must be covered with a suitable and secure nailing base.

E. Plywood roof sheathing must be installed in accordance with Table No. 23-II-E-1 reproduced on page 11.

Table No. 15-B-1/Asphalt Shingle Application

	ASPHALT SHINGLES	
Roof Slope	**Not Permitted below 2 Units Vertical in 12 Units Horizontal (16.7% Slope)**	
	2 Units Vertical in 12 Units Horizontal (16.7% Slope) to Less Than 4 Units Vertical in 12 Units Horizontal (33.3% Slope)	**4 Units Vertical in 12 Units Horizontal (33.3% Slope) and Over**
1. Deck Requirement	Asphalt shingles shall be fastened to solidly sheathed roofs. Sheathing shall conform to Sections 2312.2 and 2320.129.	
2. Underlayment Temperate climate	Asphalt strip shingles may be installed on slopes as low as 2 inches in 12 inches, provided the shingles are approved self-sealing or are hand-sealed and are installed with an underlayment consisting of two layers of nonperforated Type 15 felt applied shingle fashion. Starting with an 18-inch-wide sheet and a 36-inch-wide sheet over it at the eaves, each subsequent sheet shall be lapped 19 inches horizontally.	One layer nonperforated Type 15 felt lapped 2 inches horizontally and 4 inches vertically to shed water.
3. Attachment combined systems, type of fasteners	Corrosion-resistant nails, minimum 12-gauge $^{3}/_{8}$-inch head, or approved corrosion-resistant staples, minimum 16-gauge $^{15}/_{16}$-inch crown width. Fasteners shall comply with the requirements of Chapter 23, Division III. Fasteners shall be long enough to penetrate into the sheathing $^{3}/_{4}$ inch or through the thickness of the sheathing, whichever is less.	
No. of fasteners[1]	4 per 36-inch to 40-inch strip 2 per 9-inch to 18-inch shingle	
Exposure Field of roof Hips and ridges	Per manufacturer's instructions included with packages of shingles. Hip and ridge weather exposures shall not exceed those permitted for the field of the roof.	
Method	Per manufacturer's instructions included with packages of shingles.	
4. Flashing Valleys Other flashings	Per Section 1508.2 Per Section 1509	

[1] Figures shown are for normal application. For special conditions such as mansard application and where roofs are in special wind regions, shingles shall be attached per manufacturer's instructions.

Table No. 15-B-2 Wood Shingle Or Shake Application

	WOOD SHINGLES	WOOD SHAKES
ROOF SLOPE	**Not Permitted below 3 Units Verticle in 12 Units Horizontal (25% Slope)**	**Not Permitted below 4 Units Vertical in 12 Units Horizontal (33.3% Slope)[1]**
	See Table No. 15-C	**See Table No. 15-C**
1. Deck Requirement	Shingles and shakes shall be applied to roofs with solid or spaced sheathing. When spaced sheathing is used, sheathing boards shall not be less than 1 inch by 4 inches nominal dimensions and shall be spaced on centers equal to the weather exposure to coincide with the placement of fasteners. When 1-inch by 4-inch spaced sheathing is installed at 10 inches on center, additional 1-inch by 4-inch boards must be installed between the sheathing boards. Sheathing shall conform to Section 2312.2 and 2312.9.	
2. Interlayment	No Requirements	One 18-inch-wide interlayment of Type 30 felt shingled between each course in such a manner that no felt is exposed to the weather below the shake butts and in the keyways (between the shakes).
3. Underlayment Temperate climate	No Requirements	No Requirements
4. Attachment Type of fasteners	Corrosion-resistant nails, minimum $14^{1}/_{2}$-gauge $^{7}/_{32}$-inch head, or corrosion-resistant staples, when approved by the building official.	Corrosion-resistant nails, minimum No. 13-gauge $^{7}/_{32}$-inch head, or approved corrosion-resistant staples, when approved by the building official.
	Fasteners shall comply with the requirements of Chapter 23, Division III. Fasteners shall be long enough to penetrate into the sheathing $^{3}/_{4}$ inch or through the thickness of the sheathing, whichever is less.	
No. of fasteners	2 per shingle	2 per shake
Exposure Field of roof Hips and ridges	Weather exposures shall not exceed those set forth in Table No. 15-C. Hip and ridge weather exposure shall not exceed those permitted for the field of the roof.	
Method	Shingles shall be laid with a side lap of not less than $1^{1}/_{2}$ inches between joints in adjacent courses, and not in direct alignment in alternate courses. Spacing between shingles shall be approximately $^{1}/_{4}$ inch. Each shingle shall be fastened with two nails only, positioned approximately $^{3}/_{4}$ inch from each edge and approximately 1 inch above the exposure line. Starter course at the eaves shall be doubled.	Shakes shall be laid with a side lap of not less than $1^{1}/_{2}$ inches between joints in adjacent courses. Spacing between shakes shall not be less than $^{3}/_{8}$ inch or more than $^{5}/_{8}$ inch except for preservative-treated wood shakes which shall have a spacing not less than $^{1}/_{4}$ inch or more than $^{3}/_{8}$ inch. Shakes shall be fastened to the sheathing with two nails only, positioned approximately 1 inch from each edge and approximately 2 inches above the exposure line. The starter course at the eaves shall be doubled. The bottom or first layer may be either shakes or shingles. Fifteen-inch or eighteen-inch shakes may be used for the starter course at the eaves and final course at the ridge.
5. Flashing Valleys Other flashings	Per Section 1508.5 Per Section 1509	

[1] When approved by the building official, wood shakes maybe installed on a slope of not less than 3 units in 12 Units horizontal (25% slope) when an underlayment of not less than nonperforated Type 15 felt is installed.

Table No. 15-D-1/Roofing Tile Application[1] For All Tiles

	Roof slope 2 1/2 Units Vertical in 12 Units Horizontal (21% Slope) to Less Than 3 Units Vertical in 12 Units Horizontal (25% Slope)	**Roof slope 3 Units Vertical in 12 Units Horizontal (25% Slope) and over**
1. Deck Requirements	Solid sheathing per Sections 2312.2 and 2320.12.9	
2. Under layment	Built-up roofing membrane, three plies minimum, applied per Section 1507.6. Surfacing not required.	One layer heavy-duty felt or Type 30 felt side lapped 2 inches and end lapped 6 inches.
3. Attachment[2] Type of fasteners	Corrosion-resistant nails not less than No. 11 gauge, 5/16-inch head. Fasteners shall comply with the requirements of Chapter 23, Division III. Fasteners shall be long enough to penetrate into the sheathing 3/4 inch or through the thickness of the sheathing, whichever is less. Attaching wire for clay or concrete tile shall not be smaller than 0.083 inch (No. 14 B.W. gauge).	
Number of fasteners[2,3]	One fastener per tile. Flat tile without vertical laps, two fasteners per tile.	Two fasteners per tile. Only one fastener on slopes of 7 units vertical in 12 units horizontal (58.3% slope) and less for tiles with installed weight exceeding 7.5 pounds per square foot having a width no greater than 16 inches.[4]
4. Tile headlap	3 inches minimum	
5. Flashing	Per Sections 1508.4 and 1509	

[1] In snow areas a minimum of two fasteners per tile are required.

[2] In areas designated by the building official as being subject to repeated wind velocities to excess of 80 miles per hour or where the roof height exceeds 40 feet above grade, all tiles shall be attached as follows:

[2.1] The heads of all tiles shall be nailed.

[2.2] The noses of all eave course tiles shall be fastened with approved clips.

[2.3] All rake tiles shall be nailed with two nails.

[2.4] The noses of all ridge, hip and rake tiles shall be set in a bead of approved roofer's mastic.

[3] In snow areas, a minimum of two fasterners per tile are required, or battens and one fastener.

[4] On slopes over 24 units vertical in 12 units horizontal (200% slope), the nose end of all tiles shall be securely fastened.

Table No. 15-E/ Built-Up Roof Covering Application

	Mechanically fastened systems	Adhesively fastened systems
1. Deck conditions	Decks shall be firm, broom-clean, smooth and dry. Insulated decks shall have wood insulation stops at all edges of the deck, unless an alternative suitable curbing is provided. Insulated decks with slopes greater than 2 units vertical in 12 units horizontal (16.7% slope) shall have wood insulation stops at not more than 8 feet face to face. Wood nailers shall be provided where nailing is required for roofing plies.	
	Solid wood sheathing shall conform to Sections 2312.2 and 2320.12.9.	Provide wood nailers where nailing is required for roofing plies (see below).
2. Underlayment	One layer of sheathing paper, Type 15 felt or other approved underlayment nailed sufficiently to hold in place, is required over board decks where openings between boards would allow bitumen to drip through. No underlayment requirements for plywood decks. Underlayment on other decks shall be in accordance with deck manufacturer's recommendations.	Not required
3. Base ply requirements Over noninsulated decks	Over approved decks, the base ply shall be nailed using not than less one fastener for each $1^{1}/_{3}$ square feet.	Decks shall be primed in accordance with the roofing manufacturer's instructions. The base ply shall be solidly cemented or spot mopped as required by the type of deck material using adhesive application rates shown in Table 15-F.
4. Mechanical fasteners	Fasteners shall be long enough to penetrate $^{3}/_{4}$ inch into the sheathing or through the thickness of the sheathing, whichever is less. Built-up roofing nails for wood board decks shall be minimum No. 12 gauge $^{7}/_{16}$-inch head driven through tin caps or approved nails with integral caps. For plywood, No. 11 gauge ring-shank nails driven through tin caps or approved nails with integral caps shall be used. For gypsum, insulating concrete, cementitious wood fiber and other decks, fasteners recommended by the manufacturer shall be used.	When mechanical fasteners are required for attachment of roofing plies to wood nailers or insulation stops (see below), they shall be as required for wood board decks.
5. Vapor retarder Over insulated decks	A vapor retarder shall be installed where the average January temperature is below 45°F, or where excessive moisture conditions are anticipated within the building. It shall be applied as for a base ply.	
6. Insulation	When no vapor retarder is required, roof insulation shall be fastened in an approved manner. When a vapor retarder is required, roof insulation is to be solidly mopped to the vapor retarder using the adhesive application rate specified in Table No. 15-F. See manufacturer's instructions for the attachment of insulation over steel decks.	When no vapor retarder is required, roof insulation shall be solid mopped to the deck using the adhesive application rate specified in Table 15-F. When a vapor retarder is required, roof insulation is to be solidly mopped to the vapor retarder, using the adhesive application rate specified in Table 15-F. See manufacturer's installation instructions for attachment of insulation over steel decks.
7. Roofing plies	Successive layers shall be solidly cemented together and to the base ply or the insulation using the adhesive rates shown in Table 15-F. On slopes greater than 1 unit vertical in 12 units horizontal (8.3% slope) for aggregate-surfaced, or 2 units vertical in 12 units horizontal (16.7% slope) for smooth-surfaced, or cap sheet-surfaced roofs, mechanical fasteners are required. Roofing plies shall be blind-nailed to the deck, wood nailers or wood insulation stops in accordance with the roofing manufacturer's recommendations. On slopes exceeding 3 units vertical in 12 units horizontal (25% slope), plies shall be laid parallel to the slope of the deck (strapping method).	
8. Cementing materials	See Table 15-G.	
9. Curbs and walls	Suitable cant strips shall be used at all vertical intersections. Adequate attachment shall be provided for both base flashing and counterflashing on all vertical surfaces. Reglets shall be provided in wall or parapets receiving metal counterflashing.	
10. Surfacing	Mineral aggregate surfaced roofs shall comply with the requirements of Standard 15-1 and Table 15-F. Cap sheets shall be cemented to the roofing plies as set forth in Table 15-F.	

Table No. 23-II-E-1/Allowable Spans and loads for wood structural panel sheathing and single-floor grades continuous over two or more spans with strength axis perpendicular to supports. [1,2]

Sheathing Grades		Roof[3]				Floor[4]
Panel Span Rating	Plywood Thickness (Inches)	Maximum Span (Inches)		Load[5] (Pounds per sq. ft.)		Floor Maximum
Roof/ Floor Span		With Edge Support[6]	Without Edge Support	Total Load	Live Load	
12/0	5/16	12	12	40	30	0
16/0	5/16 , 3/8	16	16	40	30	0
20/0	5/16 , 3/8	20	20	40	30	0
24/0	3/8, 7/16 , 1/2	24	20[7]	40	30	0
24/16	7/16 , 1/2	24	24	50	40	16
32/16	15/32 , 1/2, 5/8	32	28	40	30	16[8]
40/20	19/32 , 5/8, 3/4 , 7/8	40	32	40	30	20[8, 9]
48/24	23/32 , 3/4 , 7/8	48	36	45	35	24
54/32	7/8, 1	54	40	45	35	32
60/48	7/8, 1, 1 1/8	60	48	45	35	48
Single-Floor Grades		**Roof[3]**				**Floor[4]**
Panel Span Rating (Inches)	Plywood Thickness (inches)	Maximum Span (Inches)		Load[5] (Pounds per sq. ft.)		Floor Maximum Span (inches)
		With Edge Support[6]	Without Edge Support	Total Load	Live Load	
16 oc	1/2, 19/32 , 5/8	24	24	50	40	16[8]
20 oc	19/32 , 5/8 , 3/4	32	32	40	30	20[8, 9]
24 oc	23/32 , 3/4	48	36	35	25	24
32 oc	7/8 , 1	48	40	50	40	32
48 oc	1 3/32 , 1 1/8	60	48	50	50	48

1 Applies to panels 24 inches or wider.

2 Floor and roof sheathing conforming with this table shall be deemed to meet the design criteria of Section 2312.

3 Uniform load deflection limitations 1/180 of span under live load plus dead load, 1/240 under live load only.

4 Panel edges shall have approved tongue-and-groove joints or shall be supported with blocking unless 1/4-inch minimum thickness underlayment, or 1 1/2 inches of approved cellular or lightweight concrete is placed over the subfloor, or finish floor is 3/4-inch wood strip. Allowable uniform load based on deflection of 1/360 of span is 100 pounds per square foot (psf) except the span rating of 48 inches on center is based on a total load of 65 psf.

5 Allowable load at maximum span.

6 Tongue-and-groove edges, panel edge clips [one midway between each support, except two equally spaced between supports 48 inches on center], lumber blocking, or other. Only lumber blocking shall satisfy blocked diaphgrams requirements.

7 For 1/2 inch panel, maximum span shall be 24 inches.

8 May be 24 inches on center where 3/4-inch wood strip flooring is installed at right angles to joist.

9 May be 24 inches on center for floors where 1 1/2 inches of cellular or lightweight concrete is applied over the panels.